

# PATENT ABSTRACTS OF JAPAN

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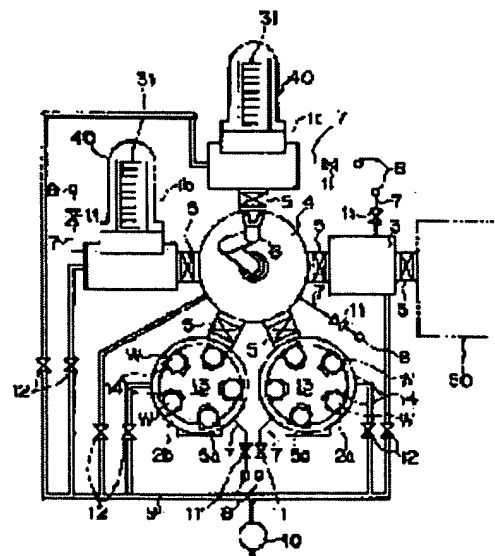
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## (54) TRANSFER PROCESSING DEVICE

### (57)Abstract:

**PURPOSE:** To prevent air pollution before the processing of a processed body, to improve a product yield, and to achieve the effective utilization of an installation space and the miniaturization of a transfer processing device.

**CONSTITUTION:** Processing chambers 1a and 1b, storage chambers 2a and 2b, and a pre-processing storage chamber 3 are disposed around a transfer chamber 4 via gate valves 5. A transfer means 6 is disposed in the transfer chamber 4 for managing the transfer of a wafer W from and into the processing chambers 1a and 1b, the storage chambers 2a and 2b and the pre-processing storage chamber 3. An N<sub>2</sub> gas supply source 8 is connected respectively to the processing chambers 1a and 1b, the storage chambers 2a and 2b, the pre-processing chamber 3 and the transfer chamber 4 via an N<sub>2</sub> gas supply pipe 7. Also, a vacuum pump 10 is connected to them via an exhaust pipe 9. Thereby, the processing chambers 1a and 1b, the storage chambers 2a and 2b, the pre-processing chamber 3 and the transfer chamber 4 are filled with an atmosphere of N<sub>2</sub> gas, and hence it is possible to prevent the adhesion of a natural oxide film and particles to the surface of the wafer W in a non-processed state or while it is being processed.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The processing room which processes a processed object, the receipt room which contains a processed object, and the receipt room for pretreatment which contains the processed object pretreated, The conveyance room arranged through an airtight closing motion means between the above-mentioned processing room, a receipt room, and the receipt room for pretreatment, The conveyance processor carry out it being arranged in the above-mentioned conveyance interior of a room, providing a conveyance means to manage taking out and carrying in of the above-mentioned processing room, a receipt room, and the processed object of the receipt interior of a room for pretreatment, and carrying out the above-mentioned processing room, a receipt room, the receipt room for pretreatment, and the conveyance interior of a room as a predetermined gas ambient atmosphere as the description.

[Claim 2] The conveyance processor according to claim 1 carry out constituting at the conveyance mechanical component which exposes a conveyance means to the conveyance interior of a room, and the above-mentioned conveyance room and the rise-and-fall mechanical component arranged in the drive interior of a room divided, arranging an airtight means intercept a conveyance room and a drive room when a conveyance mechanical component is maximum-exposed to the conveyance interior of a room between the above-mentioned conveyance mechanical component and a rise-and-fall mechanical component, and making the above-mentioned drive interior of a room different from the above-mentioned conveyance room to a predetermined gas ambient atmosphere as the description.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the conveyance processor which conveys processed objects, such as for example, a semi-conductor wafer, in the predetermined processing section.

[0002]

[Description of the Prior Art] The impurity installation equipment which generally introduces the thin film deposition system which forms a thin film on the surface of a wafer, the oxidation system which forms an oxide film, and an impurity in the manufacture process of a semi-conductor wafer (a wafer is told to below) is used. And the surface treatment equipment processed with a gas reaction and heating is used as equipment which forms these thin films, an oxide film, etc.

[0003] In order to process a wafer conventionally using this kind of surface treatment equipment, after heat-treating with conveyance means, such as a conveyance arm, from the cassette which held the wafer of predetermined number of sheets by conveying a wafer to the processing interior of a room of drawing and surface treatment equipment, the wafer is taken out from the processing room. Moreover, in order to aim at improvement in processing efficiency, while arranging two or more surface treatment equipments, the conveyance means is arranged to the processing room of each surface treatment equipment.

[0004]

[Problem(s) to be Solved by the Invention] However, in this conventional kind of equipment, since it was conveying to the direct-processing interior of a room out of atmospheric air when conveying a processed object in the processing room of surface treatment equipment, the processed object was exposed into atmospheric air, air pollution of the processed object was carried out by adhesion of a contaminant, formation of the natural oxidation film, etc., and there was a possibility of causing the fall of the product yield.

[0005] moreover, since it was necessary to also make a conveyance means into two or more need to two or more processing rooms, or to make the successive range of a conveyance means large when two or more processing rooms are prepared, while enlarging the installation tooth space, there was also a problem that equipment had to be enlarged.

[0006] It aims at offering the conveyance processor which this invention was made in view of the above-mentioned situation, prevents the air pollution before processing of a processed object, and aims at improvement in the product yield, and enabled it to attain a deployment of an installation tooth space, and the miniaturization of equipment.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the conveyance processor of this invention The processing room which processes a processed object, the receipt room which contains a processed object, and the receipt room for pretreatment which contains the processed object pretreated, The conveyance room arranged through an airtight closing motion means between the above-mentioned processing room, a receipt room, and the receipt room for pretreatment, It is arranged in the above-mentioned conveyance interior of a room, a conveyance means to manage taking out and carrying in of the above-mentioned processing room, a receipt room, and the processed object of the receipt interior of a room for pretreatment is provided, and it carries out carrying out the above-mentioned processing room, a receipt room, the receipt room for pretreatment, and the conveyance interior of a room as a predetermined gas ambient atmosphere as the description.

[0008] Although it will be easy to be the thing of the device of arbitration if the above-mentioned conveyance

means is arranged in the conveyance interior of a room and taking out and carrying in of a processing room, a receipt room, and the processed object of the receipt interior of a room for pretreatment are managed in this invention. A conveyance means is preferably constituted from a conveyance mechanical component exposed to the conveyance interior of a room, and the above-mentioned conveyance room and the rise-and-fall mechanical component arranged in the drive interior of a room divided. Between the above-mentioned conveyance mechanical component and a rise-and-fall mechanical component, it is better to arrange an airtight means to intercept a conveyance room and a drive room, when a conveyance mechanical component is maximum-exposed to the conveyance interior of a room, and to make the above-mentioned drive interior of a room into a predetermined gas ambient atmosphere apart from the above-mentioned conveyance room.

[0009]

[Function] According to the conveyance processor of this invention constituted as mentioned above, by making into a predetermined gas ambient atmosphere the receipt room, the receipt room for pretreatment, and the conveyance interior of a room which are connected through an airtight closing motion means, the processed object under unsettled and processing can be intercepted with atmospheric air, and can be protected from air pollution. Moreover, a processed object can be conveyed with one kind of conveyance means by arranging a conveyance room between a processing room, a receipt room, and the receipt room for pretreatment. Moreover, the rise-and-fall mechanical component of the drive interior of a room is made as for *Lycium chinense* to a vacuum ambient atmosphere at \*\*\*\* at a predetermined gas ambient atmosphere by making into a predetermined gas ambient atmosphere the drive interior of a room divided from a conveyance room apart from a conveyance room.

[0010]

[Example] The example of this invention is explained at a detail based on a drawing below. Here, the case where the conveyance processor of this invention is applied to the surface treatment equipment of a wafer is explained.

[0011] As for drawing 1, the outline block diagram of the conveyance processor of this invention is shown, and, as for drawing 2, that outline perspective view is shown.

[0012] Two processing rooms 1a and 1b where the conveyance processor of this invention processes the wafer W which is a processed object, it comes to provide two receipt rooms 2a which contains Wafer W, 2b, the receipt room 3 for pretreatment which contains the wafer W pretreated, and the conveyance room 4 arranged through the gate valve 5 which is an airtight closing motion means between the processing rooms 1a and 1b, receipt room 2a, 2b, and the receipt room 3 for pretreatment. And in the conveyance room 4, a conveyance means 6 to manage taking out and carrying in of the wafer W in the processing rooms 1a and 1b, receipt room 2a, 2b, and the receipt room 3 for pretreatment is arranged. Moreover, inert gas, such as nitrogen (N<sub>2</sub>) gas and an argon (Ar), or the supply pipe 7 (N<sub>2</sub> gas supply line is told to below) of mixed gas with these is conveyance minded [the processing rooms 1a and 1b, receipt room 2a, 2b, the receipt room 3 for pretreatment, and / 4], for example, respectively, and it is N<sub>2</sub>. While the source 8 of gas supply is connected, the vacuum pump 10 is connected through the exhaust pipe 9. In addition, bulbs 11 and 12 are arranged by the gas supply line 8 and the exhaust pipe 9, respectively.

[0013] Receipt room 2a which holds Wafer W, and 2b come to provide gate valve 5a which opens and closes between external atmospheric-air ambient atmospheres, and the turntable 13 which rotates by the rolling mechanism which is not illustrated, and five wafer cassettes 14 are laid at equal intervals on the turntable 13 in the hoop direction. Thus, receipt room 2a constituted and 2b are N<sub>2</sub> from the gas supply line 7 after decompressing to the predetermined degree of vacuum with the vacuum pump 10. It is N<sub>2</sub> from the vent pipe which is not illustrated where gas is supplied. Gas is exhausted and it is always new N<sub>2</sub>. When gas circulates, the particle generated in receipt room 2a and 2b was discharged, and adhesion of particle to Wafer W is controlled.

[0014] The conveyance means 6 arranged in the conveyance room 4 consists of a conveyance mechanical component 15 exposed in the conveyance room 4, and a rise-and-fall mechanical component 17 arranged in the conveyance room 4 and the drive room 16 divided, as shown in drawing 3. In this case, the drive base 19 which goes up and down the upper part of the drive room 16 by the rise-and-fall motor 18 by which the conveyance mechanical component 15 is arranged in the drive room 16, 1st arm 22a which rotates horizontally with the drive motor 21 arranged through the airtight means 20 of a magnetic seal etc. in the drive base 19, it is formed by the multi-indirect conveyance arm robot which consists of wafer maintenance arm it is connected [wafer /

point / of arm 22 of \*\* 2nd it is connected / 22/ point / of 1st arm 22a / pivotable b, and 2nd arm 22b ] pivotable 22c. Thus, the conveyance means 6 constituted is formed free [ a perpendicular direction (V), horizontal rotation (theta), and migration in the flexible direction (H) ] of the drive of the rise-and-fall motor 18 and a drive motor 21. In addition, although the drawing explained the case where wafer maintenance arm 22c was one, it is also possible to set spacing for wafer maintenance arm 22c suitably perpendicularly, and to prepare more than one (for example, five pieces) to it. Moreover, the movable block 23 has fixed in the lower limit section of the drive base 19, and this movable block 23 is screwed in the ball-thread shaft 25 arranged in parallel with a guide rail 24 while it is arranged possible [ sliding ] along with two guide rails 24 arranged perpendicularly in parallel in the drive room 16. And the ball-thread shaft 25 is connected with the rise-and-fall motor 18 through the transfer devices 26, such as a gear. Therefore, the ball-thread shaft 25 rotates through the transfer device 26 by the drive of the rise-and-fall motor 18, and the drive base 19 and the conveyance mechanical component 15 go up and down through the movable block 23 with rotation of the ball-thread shaft 25.

[0015] Moreover, the tie-down plate 28 is arranged in the upper part of the movable block 23 of the drive base 19 through the accordion tube 27 made from the stainless steel for buffer prevention, and the top face of this tie-down plate 28 is equipped with O ring 29 which is an airtight means to contact the circumference inferior surface of tongue of up opening of the drive room 16. Therefore, when the drive base 19 moves to the topmost part by the drive of the rise-and-fall motor 18, and O ring 29 contacts the up inferior surface of tongue of the drive room 16, the conveyance room 4 is divided by the airtight condition in the drive room 16.

[0016] Furthermore, N<sub>2</sub> [ different from the gas supply line 7 connected to the drive room 16 constituted as mentioned above at the conveyance room 4 ] Gas supply line 7a is minded and it is N<sub>2</sub>. While source-of-supply 8a is connected, a vent pipe 30 is connected, and for the conveyance room 4, the inside of the drive room 16 is N<sub>2</sub> by the gas supply system of another network. It sets in a gas ambient atmosphere.

[0017] As mentioned above, it is not necessary to make into vacuums a drive system 18, i.e., the rise-and-fall motor, an encoder which is not illustrated of the rise-and-fall mechanical component 17, and the thing for usual atmospheric air can be used by carrying out separation formation of the conveyance means 6 at the conveyance mechanical component 15 and the rise-and-fall mechanical component 17. Moreover, N<sub>2</sub> where the conveyance mechanical component 15 is maximum-exposed in the conveyance room 4, after making the inside of the conveyance room 4 into a vacua Since gas can be supplied, it is little N<sub>2</sub>. The oxygen (O<sub>2</sub>) concentration in the conveyance room 4 can be fallen by use of gas.

[0018] The surface treatment equipment 40 which heat-treats to coincidence two or more wafers W which the above-mentioned processing rooms 1a and 1b came to arrange in the interior the wafer boat 31 which goes up and down Wafer W, and were held by the wafer boat 31 above the processing rooms 1a and 1b is carried. In this case, the ramp 33 which it can go up and down with the drive which is not illustrated to a pedestal 32 as a wafer boat 31 is shown in drawing 4 , The rotor plate 34 bearing of the rotation of is made free by the rolling mechanism which is not illustrated on this ramp 33, It consists of a heat insulating mould 35 laid pivotable on this rotor plate 34, and four stanchions 36 set up above a heat insulating mould 35, and by the retention groove (not shown) of spacing, such as having been prepared in the opposite side face of each strut 36, two or more wafers W can be set and spacing can be held now.

[0019] As surface treatment equipment 40 is shown in drawing 5 , the principal part consists of reaction containers 43 which consist of a container liner 41 made from a quartz which sets spacing suitably in the shape of a said alignment, and is arranged, and an outer case 42 made from a quartz. Moreover, the outer case 42 and the container liner 41 are held in that lower limit with the tubed manifold 45 formed by stainless steel etc., respectively, and this manifold 45 is being fixed with the base plate which is not illustrated. Opening of the lower limit section of a manifold 45 is opened and closed in the ramp 33 of the above-mentioned wafer boat 31. Moreover, the injector 46 is airtightly inserted into the reaction container 43 from the side face of a manifold 45, and inner one end of this manifold 45 was crooked in the shape of L character, and is perpendicularly extended towards the upper part inside the container liner 41. Disilane (SiH<sub>4</sub>) gas and ammonia gas (NH<sub>3</sub>) which are gas for CVD from the source of gas supply (not shown) connected to the outer edge side of an injector 46 It is supplied in the reaction container 43 from effluence-of-gas opening 46a. The raw gas with which processing was presented within the reaction container 43 is discharged outside from the exhaust air way 47 established in the side face of a manifold 45.

[0020] On the other hand, the pre-treatment equipments 50, such as a washing station, are connected with the

receipt room 3 for pretreatment through the gate valve 5. In this receipt room 3 for pretreatment, the wafer temporary attaching part 37 which carries out the temporary receipt of the required wafer W of pretreatment is arranged. This wafer temporary attaching part 37 can carry out temporary maintenance of the wafer W at the retention groove 39 which set regular intervals to the wall with which it comes to lay the rectangle frame-like buffer cassette 38 in ramp 33a which can go up and down freely with the drive which is not illustrated to pedestal 32a, and the buffer cassette 38 counters, and was prepared in it, as shown in drawing 6. Therefore, where temporary maintenance of the wafer W conveyed with the conveyance means 6 is carried out at the buffer cassette 38, Wafer W can be held with the conveyance arm 51 by the side of a pre-treatment equipment 50, it can convey to a pre-treatment equipment, and batch processing and sheet processing can be changed in the receipt room 3 for pretreatment.

[0021] Next, the actuation mode of the conveyance processor of this invention is explained with reference to drawing 1.

[0022] \*\* an example 1 -- N2 after operating a vacuum pump 10 and first making the inside of receipt room 2a, 2b, the conveyance room 4, the processing rooms 1a and 1b, and the receipt room 3 for pretreatment into a vacua on the occasion of use each interior of a room from the source 8 of gas supply -- N2 gas -- supplying -- each interior of a room -- N2 It is made a gas ambient atmosphere. Under the present circumstances, the conveyance mechanical component 15 of the conveyance means 6 arranged in the conveyance room 4 is moved to the best location, the drive room 16 and the conveyance room 4 are intercepted with O ring 29, and it is N2 of another network in the drive room 16. Source of gas supply 8a to N2 The inside of the drive room 16 is also N2 by supplying gas. It is made a gas ambient atmosphere and is O2 of each \*\*. Concentration is reduced.

[0023] Next, the gate valve 5 between 1st receipt room 2a and the conveyance room 4 opens wide. After receiving Wafer W from the inside of the wafer cassette 14 by which wafer maintenance arm 22c of the conveyance means 6 inserted into receipt room 2a, and was contained in receipt room 2a, the gate valve 5 between the conveyance room 4 and 1st processing room 1a opens wide. Wafer maintenance arm 22c inserts into 1st processing room 1a, and a wafer is delivered to the wafer boat 31 in 1st processing room 1a.

[0024] Thus, predetermined processing is performed, after the gate valve 5 between the conveyance room 4 and 1st processing room 1a closing, and a wafer boat's 31 going up, after delivering the wafer W of predetermined number of sheets to a wafer boat 31, and inserting into the reaction container 43 of the 1st surface-preparation equipment 40 and intercepting the reaction container 43 and 1st processing room 1a with the ramp 33 of a wafer boat 31. While performing surface treatment of Wafer W in the 1st surface treatment equipment 40, it is also possible to deliver the wafer W in 2nd receipt room 2b to the wafer boat 31 in 2nd processing room 1b, and to process Wafer W with the 2nd surface treatment equipment 40 like the above with the conveyance means 6.

[0025] After descending a wafer boat 31 from the reaction container 43 after the surface preparation of Wafer W is completed, and moving into 1st processing room 1a, by actuation contrary to the above-mentioned, the wafer [ finishing / processing ] W is delivered to the wafer cassette 14 in 1st receipt room 2a, and processing of Wafer W is completed. Moreover, the wafer [ finishing / processing of 2nd processing room 1b / similarly ] W is received and passed to the wafer cassette 14 of 2nd receipt room 2b.

[0026] \*\* N2 after carrying out vacuum suction of each \*\* like the example 2 above-mentioned example 1 Gas is supplied and it is each interior of a room N2 It considers as a gas ambient atmosphere. And the wafer W received from receipt room 2a and 2b by the conveyance means 6 is conveyed in the receipt room 3 for pretreatment, and particle, natural oxidation film, etc. which conveyed the wafer W by which temporary maintenance was carried out at the buffer cassette 38 of the receipt room 3 for pretreatment to the pre-treatment equipment 50, and adhered to Wafer W are removed.

[0027] After delivering the wafer W to which pretreatment was performed by the pre-treatment equipment 50 to the wafer boat 31 of the processing rooms 1a and 1b like the above-mentioned example 1 and carrying out surface treatment with surface treatment equipment 40, it delivers to receipt room 2a and the wafer cassette 14 of 2b, and processing of Wafer W is completed.

[0028] \*\* Although the example 3 above-mentioned examples 1 and 2 explained the case where conveyed the wafer W taken out from receipt room 2a or 2b to one processing room 1a or 1b, and it processed with surface treatment equipment 40, it is also possible to perform surface treatment of a different class continuously.

[0029] That is, surface treatment is carried out, for example with the 1st surface treatment equipment 40, after receiving the wafer W set to 1st processing room 1a with the conveyance means 6, it can convey in 2nd processing room 1b, and the 2nd surface treatment equipment 40 can perform surface treatment. In this case,

what is necessary is to often convey the 1st surface treatment equipment 40 and the 2nd surface treatment equipment 40 in the receipt room 3 for pretreatment, when pretreatment of Wafer W is required even if reverse, and just to convey Wafer W in the 1st or processing room 1 of \*\* 2nd a, and 1b, after pretreating.

[0030] In addition, although the above-mentioned example explained the case where two processing rooms 1a and 1b, two receipt room 2a, 2b, and one receipt room 3 for pretreatment were arranged in the perimeter centering on the conveyance room 4. You may be the structure which did not necessarily have to consider as such arrangement structure and arranged one processing room 1a or 1b, receipt room 2a, or 2b in the perimeter of the conveyance room 4 at least.

[0031] Although the above-mentioned example explained the case where a processed object was a semi-conductor wafer, a processed object is not necessarily restricted to a semi-conductor wafer, and conveyance processing can be similarly carried out about for example, not a thing but a LCD substrate or a printed circuit board, a photo mask, a ceramic substrate, and a compact disk.

[0032]

[Effect of the Invention] Since it is constituted as mentioned above according to the conveyance processor of this invention as explained above, the following effectiveness is acquired.

[0033] 1) Since the receipt room, the receipt room for pretreatment, and the conveyance interior of a room which are connected through an airtight closing motion means are made into a predetermined gas ambient atmosphere according to the conveyance processor according to claim 1, while being able to intercept the processed object under unsettled and processing with atmospheric air and being able to protect it from air pollution, improvement in the product yield can be aimed at. Moreover, since a conveyance room is arranged between a processing room, a receipt room, and the receipt room for pretreatment, with one kind of conveyance means, a processed object can be conveyed and a deployment of an installation tooth space and the miniaturization of equipment can be attained.

[0034] 2) Since the drive interior of a room divided from a conveyance room is made into a predetermined gas ambient atmosphere apart from a conveyance room according to the conveyance processor according to claim 2, the rise-and-fall mechanical component of the drive interior of a room is made as for Lycium chinense to a vacuum ambient atmosphere in a predetermined gas ambient atmosphere at \*\*\*\*, and low-cost-izing of a configuration member and reduction-ization of consumption capacity can be attained.

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TECHNICAL FIELD

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[Industrial Application] This invention relates to the conveyance processor which conveys processed objects, such as for example, a semi-conductor wafer, in the predetermined processing section.

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PRIOR ART

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[Description of the Prior Art] The impurity installation equipment which generally introduces the thin film deposition system which forms a thin film on the surface of a wafer, the oxidation system which forms an oxide film, and an impurity in the manufacture process of a semi-conductor wafer (a wafer is told to below) is used. And the surface treatment equipment processed with a gas reaction and heating is used as equipment which forms these thin films, an oxide film, etc.

[0003] In order to process a wafer conventionally using this kind of surface treatment equipment, after heat-treating with conveyance means, such as a conveyance arm, from the cassette which held the wafer of predetermined number of sheets by conveying a wafer to the processing interior of a room of drawing and surface treatment equipment, the wafer is taken out from the processing room. Moreover, in order to aim at improvement in processing efficiency, while arranging two or more surface treatment equipments, the conveyance means is arranged to the processing room of each surface treatment equipment.

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EFFECT OF THE INVENTION

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[Effect of the Invention] Since it is constituted as mentioned above according to the conveyance processor of this invention as explained above, the following effectiveness is acquired.

[0033] 1) Since the receipt room, the receipt room for pretreatment, and the conveyance interior of a room which are connected through an airtight closing motion means are made into a predetermined gas ambient atmosphere according to the conveyance processor according to claim 1, while being able to intercept the processed object under unsettled and processing with atmospheric air and being able to protect it from air pollution, improvement in the product yield can be aimed at. Moreover, since a conveyance room is arranged between a processing room, a receipt room, and the receipt room for pretreatment, with one kind of conveyance means, a processed object can be conveyed and a deployment of an installation tooth space and the miniaturization of equipment can be attained.

[0034] 2) Since the drive interior of a room divided from a conveyance room is made into a predetermined gas ambient atmosphere apart from a conveyance room according to the conveyance processor according to claim 2, the rise-and-fall mechanical component of the drive interior of a room is made as for Lycium chinense to a vacuum ambient atmosphere in a predetermined gas ambient atmosphere at \*\*\*\*, and low-cost-izing of a configuration member and reduction-ization of consumption capacity can be attained.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, in this conventional kind of equipment, since it was conveying to the direct-processing interior of a room out of atmospheric air when conveying a processed object in the processing room of surface treatment equipment, the processed object was exposed into atmospheric air, air pollution of the processed object was carried out by adhesion of a contaminant, formation of the natural oxidation film, etc., and there was a possibility of causing the fall of the product yield.

[0005] moreover, since it was necessary to also make a conveyance means into two or more need to two or more processing rooms, or to make the successive range of a conveyance means large when two or more processing rooms are prepared, while enlarging the installation tooth space, there was also a problem that equipment had to be enlarged.

[0006] It aims at offering the conveyance processor which this invention was made in view of the above-mentioned situation, prevents the air pollution before processing of a processed object, and aims at improvement in the product yield, and enabled it to attain a deployment of an installation tooth space, and the miniaturization of equipment.

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MEANS

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[Means for Solving the Problem] In order to attain the above-mentioned purpose, the conveyance processor of this invention The processing room which processes a processed object, the receipt room which contains a processed object, and the receipt room for pretreatment which contains the processed object pretreated, The conveyance room arranged through an airtight closing motion means between the above-mentioned processing room, a receipt room, and the receipt room for pretreatment, It is arranged in the above-mentioned conveyance interior of a room, a conveyance means to manage taking out and carrying in of the above-mentioned processing room, a receipt room, and the processed object of the receipt interior of a room for pretreatment is provided, and it carries out carrying out the above-mentioned processing room, a receipt room, the receipt room for pretreatment, and the conveyance interior of a room as a predetermined gas ambient atmosphere as the description.

[0008] Although it will be easy to be the thing of the device of arbitration if the above-mentioned conveyance means is arranged in the conveyance interior of a room and taking out and carrying in of a processing room, a receipt room, and the processed object of the receipt interior of a room for pretreatment are managed in this invention A conveyance means is preferably constituted from a conveyance mechanical component exposed to the conveyance interior of a room, and the above-mentioned conveyance room and the rise-and-fall mechanical component arranged in the drive interior of a room divided. Between the above-mentioned conveyance mechanical component and a rise-and-fall mechanical component It is better to arrange an airtight means to intercept a conveyance room and a drive room, when a conveyance mechanical component is maximum-exposed to the conveyance interior of a room, and to make the above-mentioned drive interior of a room into a predetermined gas ambient atmosphere apart from the above-mentioned conveyance room.

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OPERATION

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[Function] According to the conveyance processor of this invention constituted as mentioned above, by making into a predetermined gas ambient atmosphere the receipt room, the receipt room for pretreatment, and the conveyance interior of a room which are connected through an airtight closing motion means, the processed object under unsettled and processing can be intercepted with atmospheric air, and can be protected from air pollution. Moreover, a processed object can be conveyed with one kind of conveyance means by arranging a conveyance room between a processing room, a receipt room, and the receipt room for pretreatment. Moreover, the rise-and-fall mechanical component of the drive interior of a room is made as for Lycium chinense to a vacuum ambient atmosphere at \*\*\*\* at a predetermined gas ambient atmosphere by making into a predetermined gas ambient atmosphere the drive interior of a room divided from a conveyance room apart from a conveyance room.

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EXAMPLE

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[Example] The example of this invention is explained at a detail based on a drawing below. Here, the case where the conveyance processor of this invention is applied to the surface treatment equipment of a wafer is explained.

[0011] As for drawing 1, the outline block diagram of the conveyance processor of this invention is shown, and, as for drawing 2, that outline perspective view is shown.

[0012] Two processing rooms 1a and 1b where the conveyance processor of this invention processes the wafer W which is a processed object, It comes to provide two receipt room 2a which contains Wafer W, 2b, the receipt room 3 for pretreatment which contains the wafer W pretreated, and the conveyance room 4 arranged through the gate valve 5 which is an airtight closing motion means between the processing rooms 1a and 1b, receipt room 2a, 2b, and the receipt room 3 for pretreatment. And in the conveyance room 4, a conveyance means 6 to manage taking out and carrying in of the wafer W in the processing rooms 1a and 1b, receipt room 2a, 2b, and the receipt room 3 for pretreatment is arranged. Moreover, inert gas, such as nitrogen (N<sub>2</sub>) gas and an argon (Ar), or the supply pipe 7 (N<sub>2</sub> gas supply line is told to below) of mixed gas with these is conveyance minded [ the processing rooms 1a and 1b, receipt room 2a, 2b, the receipt room 3 for pretreatment, and / 4 ], for example, respectively, and it is N<sub>2</sub>. While the source 8 of gas supply is connected, the vacuum pump 10 is connected through the exhaust pipe 9. In addition, bulbs 11 and 12 are arranged by the gas supply line 8 and the exhaust pipe 9, respectively.

[0013] Receipt room 2a which holds Wafer W, and 2b come to provide gate valve 5a which opens and closes between external atmospheric-air ambient atmospheres, and the turntable 13 which rotates by the rolling mechanism which is not illustrated, and five wafer cassettes 14 are laid at equal intervals on the turntable 13 in the hoop direction. Thus, receipt room 2a constituted and 2b are N<sub>2</sub> from the gas supply line 7 after decompressing to the predetermined degree of vacuum with the vacuum pump 10. It is N<sub>2</sub> from the vent pipe which is not illustrated where gas is supplied. Gas is exhausted and it is always new N<sub>2</sub>. When gas circulates, the particle generated in receipt room 2a and 2b was discharged, and adhesion of particle to Wafer W is controlled.

[0014] The conveyance means 6 arranged in the conveyance room 4 consists of a conveyance mechanical component 15 exposed in the conveyance room 4, and a rise-and-fall mechanical component 17 arranged in the conveyance room 4 and the drive room 16 divided, as shown in drawing 3. In this case, the drive base 19 which goes up and down the upper part of the drive room 16 by the rise-and-fall motor 18 by which the conveyance mechanical component 15 is arranged in the drive room 16, 1st arm 22a which rotates horizontally with the drive motor 21 arranged through the airtight means 20 of a magnetic seal etc. in the drive base 19, It is formed by the multi-indirect conveyance arm robot which consists of wafer maintenance arm it is connected [ wafer / point / of arm 22 of \*\* 2nd it is connected / 22 / point / of 1st arm 22a / pivotable b, and 2nd arm 22b ] pivotable 22c. Thus, the conveyance means 6 constituted is formed free [ a perpendicular direction (V), horizontal rotation (theta), and migration in the flexible direction (H) ] of the drive of the rise-and-fall motor 18 and a drive motor 21. In addition, although the drawing explained the case where wafer maintenance arm 22c was one, it is also possible to set spacing for wafer maintenance arm 22c suitably perpendicularly, and to prepare more than one (for example, five pieces) to it. Moreover, the movable block 23 has fixed in the lower limit section of the drive base 19, and this movable block 23 is screwed in the ball-thread shaft 25 arranged in parallel with a guide rail 24 while it is arranged possible [ sliding ] along with two guide rails 24 arranged perpendicularly in parallel in the drive room 16. And the ball-thread shaft 25 is connected with the rise-and-fall motor 18 through the transfer devices 26, such as a gear. Therefore, the ball-thread shaft 25 rotates through the

transfer device 26 by the drive of the rise-and-fall motor 18, and the drive base 19 and the conveyance mechanical component 15 go up and down through the movable block 23 with rotation of the ball-thread shaft 25.

[0015] Moreover, the tie-down plate 28 is arranged in the upper part of the movable block 23 of the drive base 19 through the accordion tube 27 made from the stainless steel for buffer prevention, and the top face of this tie-down plate 28 is equipped with O ring 29 which is an airtight means to contact the circumference inferior surface of tongue of up opening of the drive room 16. Therefore, when the drive base 19 moves to the topmost part by the drive of the rise-and-fall motor 18, and O ring 29 contacts the up inferior surface of tongue of the drive room 16, the conveyance room 4 is divided by the airtight condition in the drive room 16.

[0016] Furthermore, N<sub>2</sub> [ different from the gas supply line 7 connected to the drive room 16 constituted as mentioned above at the conveyance room 4 ] Gas supply line 7a is minded and it is N<sub>2</sub>. While source-of-supply 8a is connected, a vent pipe 30 is connected, and for the conveyance room 4, the inside of the drive room 16 is N<sub>2</sub> by the gas supply system of another network. It sets in a gas ambient atmosphere.

[0017] As mentioned above, it is not necessary to make into vacuums a drive system 18, i.e., the rise-and-fall motor, an encoder which is not illustrated of the rise-and-fall mechanical component 17, and the thing for usual atmospheric air can be used by carrying out separation formation of the conveyance means 6 at the conveyance mechanical component 15 and the rise-and-fall mechanical component 17. Moreover, N<sub>2</sub> where the conveyance mechanical component 15 is maximum-exposed in the conveyance room 4, after making the inside of the conveyance room 4 into a vacua Since gas can be supplied, it is little N<sub>2</sub>. The oxygen (O<sub>2</sub>) concentration in the conveyance room 4 can be fallen by use of gas.

[0018] The surface treatment equipment 40 which heat-treats to coincidence two or more wafers W which the above-mentioned processing rooms 1a and 1b came to arrange in the interior the wafer boat 31 which goes up and down Wafer W, and were held by the wafer boat 31 above the processing rooms 1a and 1b is carried. In this case, the ramp 33 which it can go up and down with the drive which is not illustrated to a pedestal 32 as a wafer boat 31 is shown in drawing 4 , The rotor plate 34 bearing of the rotation of is made free by the rolling mechanism which is not illustrated on this ramp 33, It consists of a heat insulating mould 35 laid pivotable on this rotor plate 34, and four stanchions 36 set up above a heat insulating mould 35, and by the retention groove (not shown) of spacing, such as having been prepared in the opposite side face of each strut 36, two or more wafers W can be set and spacing can be held now.

[0019] As surface treatment equipment 40 is shown in drawing 5 , the principal part consists of reaction containers 43 which consist of a container liner 41 made from a quartz which sets spacing suitably in the shape of a said alignment, and is arranged, and an outer case 42 made from a quartz. Moreover, the outer case 42 and the container liner 41 are held in that lower limit with the tubed manifold 45 formed by stainless steel etc., respectively, and this manifold 45 is being fixed with the base plate which is not illustrated. Opening of the lower limit section of a manifold 45 is opened and closed in the ramp 33 of the above-mentioned wafer boat 31. Moreover, the injector 46 is airtightly inserted into the reaction container 43 from the side face of a manifold 45, and inner one end of this manifold 45 was crooked in the shape of L character, and is perpendicularly extended towards the upper part inside the container liner 41. Disilane (SiH<sub>4</sub>) gas and ammonia gas (NH<sub>3</sub>) which are gas for CVD from the source of gas supply (not shown) connected to the outer edge side of an injector 46 It is supplied in the reaction container 43 from effluence-of-gas opening 46a. The raw gas with which processing was presented within the reaction container 43 is discharged outside from the exhaust air way 47 established in the side face of a manifold 45.

[0020] On the other hand, the pre-treatment equipments 50, such as a washing station, are connected with the receipt room 3 for pretreatment through the gate valve 5. In this receipt room 3 for pretreatment, the wafer temporary attaching part 37 which carries out the temporary receipt of the required wafer W of pretreatment is arranged. This wafer temporary attaching part 37 can carry out temporary maintenance of the wafer W at the retention groove 39 which set regular intervals to the wall with which it comes to lay the rectangle frame-like buffer cassette 38 in ramp 33a which can go up and down freely with the drive which is not illustrated to pedestal 32a, and the buffer cassette 38 counters, and was prepared in it, as shown in drawing 6 . Therefore, where temporary maintenance of the wafer W conveyed with the conveyance means 6 is carried out at the buffer cassette 38, Wafer W can be held with the conveyance arm 51 by the side of a pre-treatment equipment 50, it can convey to a pre-treatment equipment, and batch processing and sheet processing can be changed in the receipt room 3 for pretreatment.

[0021] Next, the actuation mode of the conveyance processor of this invention is explained with reference to drawing 1.

[0022] \*\* an example 1 -- N2 after operating a vacuum pump 10 and first making the inside of receipt room 2a, 2b, the conveyance room 4, the processing rooms 1a and 1b, and the receipt room 3 for pretreatment into a vacua on the occasion of use each interior of a room from the source 8 of gas supply -- N2 gas -- supplying -- each interior of a room -- N2 It is made a gas ambient atmosphere. Under the present circumstances, the conveyance mechanical component 15 of the conveyance means 6 arranged in the conveyance room 4 is moved to the best location, the drive room 16 and the conveyance room 4 are intercepted with O ring 29, and it is N2 of another network in the drive room 16. Source of gas supply 8a to N2 The inside of the drive room 16 is also N2 by supplying gas. It is made a gas ambient atmosphere and is O2 of each \*\*. Concentration is reduced.

[0023] Next, the gate valve 5 between 1st receipt room 2a and the conveyance room 4 opens wide. After receiving Wafer W from the inside of the wafer cassette 14 by which wafer maintenance arm 22c of the conveyance means 6 inserted into receipt room 2a, and was contained in receipt room 2a, the gate valve 5 between the conveyance room 4 and 1st processing room 1a opens wide. Wafer maintenance arm 22c inserts into 1st processing room 1a, and a wafer is delivered to the wafer boat 31 in 1st processing room 1a.

[0024] Thus, predetermined processing is performed, after the gate valve 5 between the conveyance room 4 and 1st processing room 1a closing, and a wafer boat's 31 going up, after delivering the wafer W of predetermined number of sheets to a wafer boat 31, and inserting into the reaction container 43 of the 1st surface-preparation equipment 40 and intercepting the reaction container 43 and 1st processing room 1a with the ramp 33 of a wafer boat 31. While performing surface treatment of Wafer W in the 1st surface treatment equipment 40, it is also possible to deliver the wafer W in 2nd receipt room 2b to the wafer boat 31 in 2nd processing room 1b, and to process Wafer W with the 2nd surface treatment equipment 40 like the above with the conveyance means 6.

[0025] After descending a wafer boat 31 from the reaction container 43 after the surface preparation of Wafer W is completed, and moving into 1st processing room 1a, by actuation contrary to the above-mentioned, the wafer [ finishing / processing ] W is delivered to the wafer cassette 14 in 1st receipt room 2a, and processing of Wafer W is completed. Moreover, the wafer [ finishing / processing of 2nd processing room 1b / similarly ] W is received and passed to the wafer cassette 14 of 2nd receipt room 2b.

[0026] \*\* N2 after carrying out vacuum suction of each \*\* like the example 2 above-mentioned example 1 Gas is supplied and it is each interior of a room N2 It considers as a gas ambient atmosphere. And the wafer W received from receipt room 2a and 2b by the conveyance means 6 is conveyed in the receipt room 3 for pretreatment, and particle, natural oxidation film, etc. which conveyed the wafer W by which temporary maintenance was carried out at the buffer cassette 38 of the receipt room 3 for pretreatment to the pre-treatment equipment 50, and adhered to Wafer W are removed.

[0027] After delivering the wafer W to which pretreatment was performed by the pre-treatment equipment 50 to the wafer boat 31 of the processing rooms 1a and 1b like the above-mentioned example 1 and carrying out surface treatment with surface treatment equipment 40, it delivers to receipt room 2a and the wafer cassette 14 of 2b, and processing of Wafer W is completed.

[0028] \*\* Although the example 3 above-mentioned examples 1 and 2 explained the case where conveyed the wafer W taken out from receipt room 2a or 2b to one processing room 1a or 1b, and it processed with surface treatment equipment 40, it is also possible to perform surface treatment of a different class continuously.

[0029] That is, surface treatment is carried out, for example with the 1st surface treatment equipment 40, after receiving the wafer W set to 1st processing room 1a with the conveyance means 6, it can convey in 2nd processing room 1b, and the 2nd surface treatment equipment 40 can perform surface treatment. In this case, what is necessary is to often convey the 1st surface treatment equipment 40 and the 2nd surface treatment equipment 40 in the receipt room 3 for pretreatment, when pretreatment of Wafer W is required even if reverse, and just to convey Wafer W in the 1st or processing room 1 of \*\* 2nd a, and 1b, after pretreating.

[0030] In addition, although the above-mentioned example explained the case where two processing rooms 1a and 1b, two receipt room 2a, 2b, and one receipt room 3 for pretreatment were arranged in the perimeter centering on the conveyance room 4 You may be the structure which did not necessarily have to consider as such arrangement structure and arranged one processing room 1a or 1b, receipt room 2a, or 2b in the perimeter of the conveyance room 4 at least.

[0031] Although the above-mentioned example explained the case where a processed object was a semi-conductor wafer, a processed object is not necessarily restricted to a semi-conductor wafer, and conveyance

processing can be similarly carried out about for example, not a thing but a LCD substrate or a printed circuit board, a photo mask, a ceramic substrate, and a compact disk.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the conveyance processor of this invention.

[Drawing 2] It is the outline perspective view of the conveyance processor of this invention.

[Drawing 3] It is the sectional view showing the conveyance means in this invention.

[Drawing 4] It is the outline perspective view showing the wafer boat and conveyance means in this invention.

[Drawing 5] It is the sectional view showing the heat treating furnace in this invention.

[Drawing 6] It is the outline perspective view showing the installation base of the pretreatment receipt room in this invention.

[Description of Notations]

W Semi-conductor wafer (processed object)

1a, 1b Processing room

2a, 2b Receipt room

3 Receipt Room for Pretreatment

4 Conveyance Room

5 Gate Valve (Airtight Closing Motion Means)

6 Conveyance Means

7 7a N<sub>2</sub> Gas supply line

8 8a N<sub>2</sub> Source of gas supply

10 Vacuum Pump

15 Conveyance Mechanical Component

16 Drive Room

17 Rise-and-Fall Mechanical Component

29 O Ring (Airtight Means)

40 Surface Treatment Equipment

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[Translation done.]

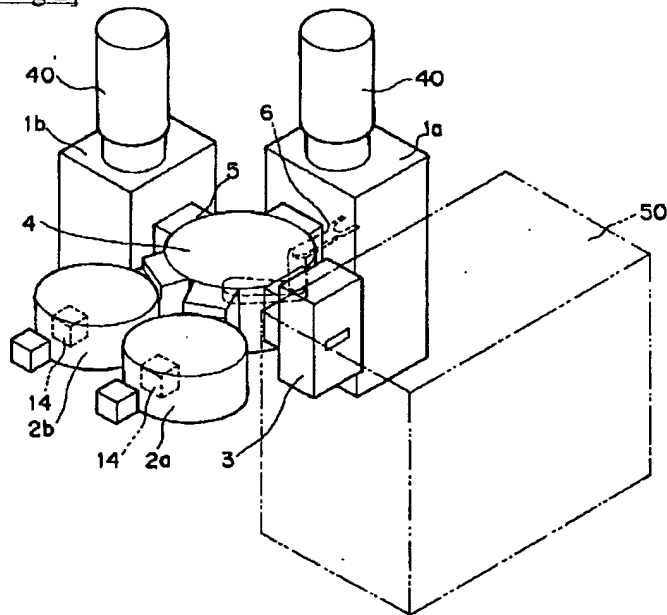
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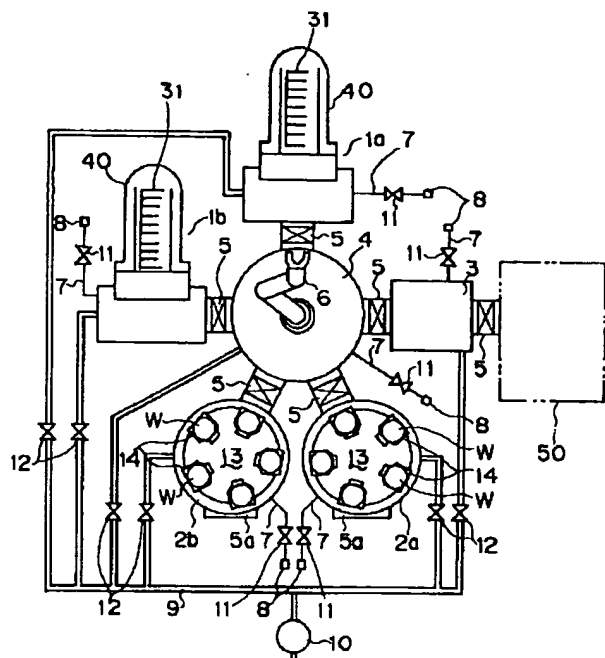
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- 3.In the drawings, any words are not translated.

## DRAWINGS

[Drawing 2]

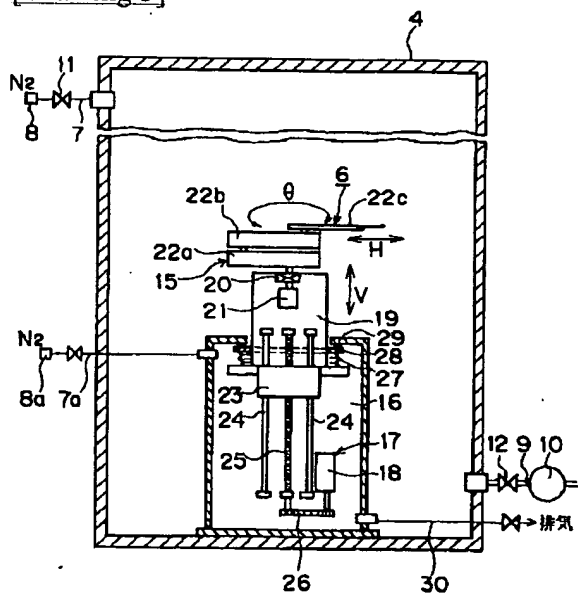


[Drawing 1]



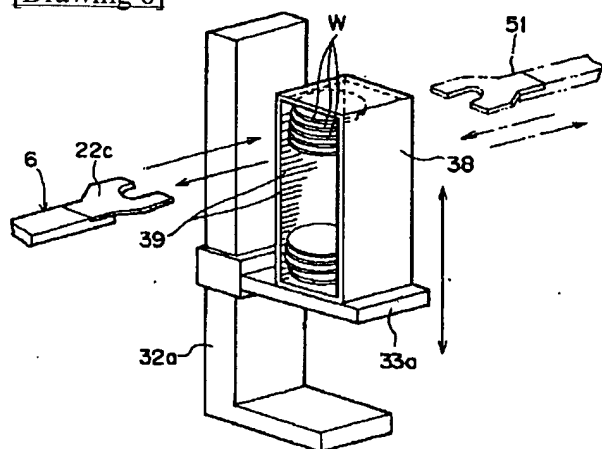
- W 半導体ウェハ (被処理体)    5 ゲートバルブ (気密閉閉手段)  
 1 a, 1 b 処理室    6 搬送手段  
 2 a, 2 b 収納室    7, 7 a N<sub>1</sub> ガス供給管  
 3 前処理用収納室    8, 8 a N<sub>2</sub> ガス供給源  
 4 搬送室    10 真空ポンプ  
 40 表面処理装置

[Drawing 3]

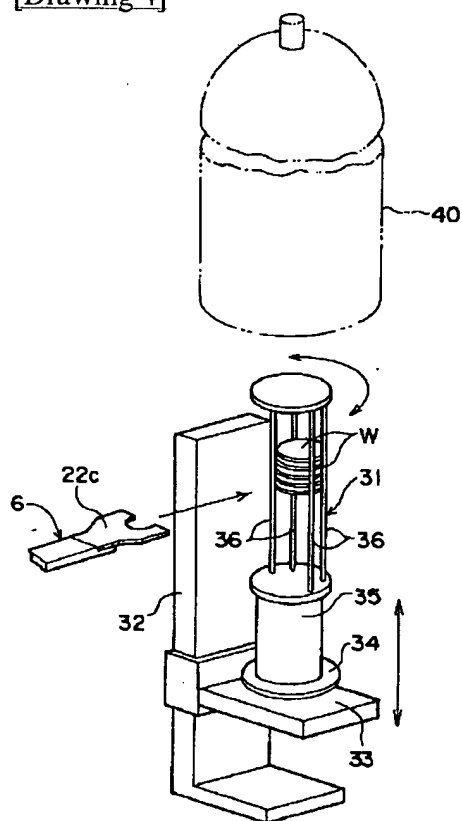


- 15 搬送駆動部  
 16 駆動室  
 17 昇降駆動部  
 29 Oリング (気密手段)

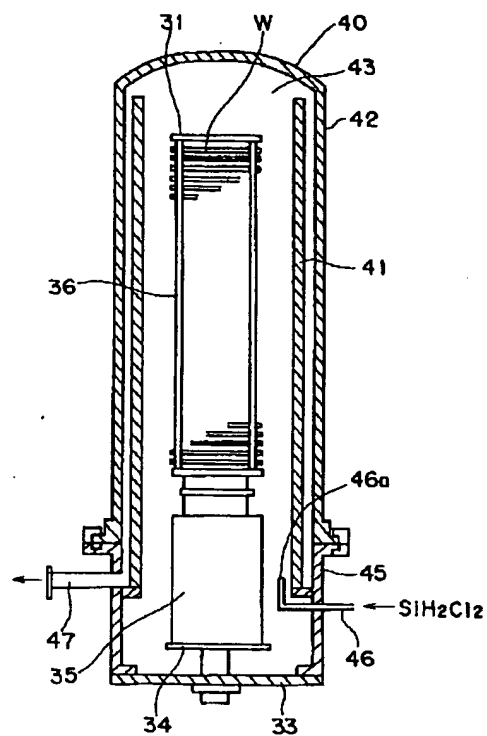
[Drawing 6]



[Drawing 4]



[Drawing 5]



[Translation done.]

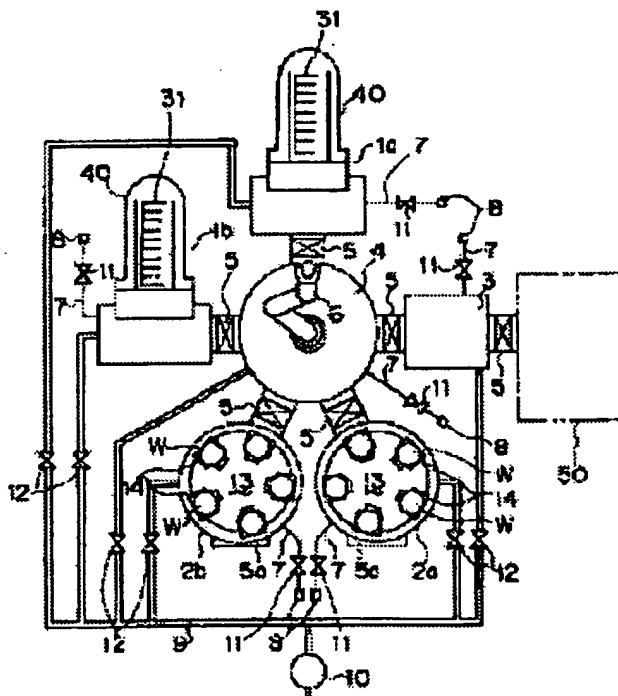
## TRANSFER PROCESSING DEVICE

**Patent number:** JP6151558  
**Publication date:** 1994-05-31  
**Inventor:** HONMA KENJI; others: 03  
**Applicant:** TOKYO ELECTRON LTD; others: 01  
**Classification:**  
 - international: H01L21/68; H01L21/22; H01L21/31  
 - european:  
**Application number:** JP19920323703 19921109  
**Priority number(s):**

### Abstract of JP6151558

**PURPOSE:** To prevent air pollution before the processing of a processed body, to improve a product yield, and to achieve the effective utilization of an installation space and the miniaturization of a transfer processing device.

**CONSTITUTION:** Processing chambers 1a and 1b, storage chambers 2a and 2b, and a pre-processing storage chamber 3 are disposed around a transfer chamber 4 via gate valves 5. A transfer means 6 is disposed in the transfer chamber 4 for managing the transfer of a wafer W from and into the processing chambers 1a and 1b, the storage chambers 2a and 2b and the pre-processing storage chamber 3. An N<sub>2</sub> gas supply source 8 is connected respectively to the processing chambers 1a and 1b, the storage chambers 2a and 2b, the pre-processing storage chamber 3 and the transfer chamber 4 via an N<sub>2</sub> gas supply pipe 7. Also, a vacuum pump 10 is connected to them via an exhaust pipe 9. Thereby, the processing chambers 1a and 1b, the storage chambers 2a and 2b, the pre-processing storage chamber 3 and the transfer chamber 4 are filled with an atmosphere of N<sub>2</sub> gas, and hence it is possible to prevent the adhesion of a natural oxide film and particles to the surface of the wafer W in a non-processed state or while it is being processed.



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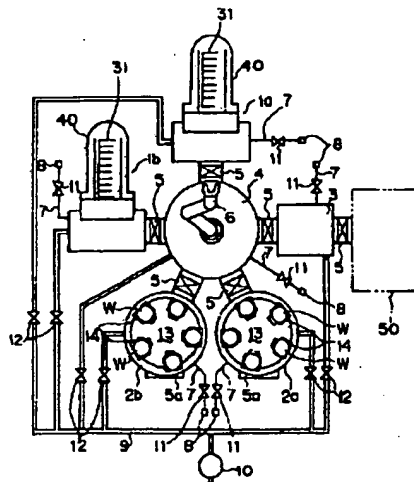
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(54) 【発明の名称】 搬送処理装置

(57) 【要約】

【目的】 被処理体の処理前の大気汚染を防止して、製品歩留りの向上を図り、かつ、設置スペースの有効利用及び装置の小型化を図る。

【構成】 搬送室4の周囲にゲートバルブ5を介して処理室1a、1b、収納室2a、2b及び前処理用収納室3を配設する。搬送室4内に、処理室1a、1b、収納室2a、2b及び前処理用収納室3内のウエハWの搬出・搬入を司る搬送手段6を配設する。処理室1a、1b、収納室2a、2b、前処理用収納室3及び搬送室4に、それぞれN<sub>2</sub>ガス供給管7を介してN<sub>2</sub>ガス供給源8を接続すると共に、排気管9を介して真空ポンプ10を接続する。これにより、処理室1a、1b、収納室2a、2b、前処理用収納室3及び搬送室4内をN<sub>2</sub>ガス雰囲気として、未処理及び処理中のウエハW表面への自然酸化膜やパーティクル等の付着を防止することができる。



W	半導体ウエハ (被処理体)	5	ゲートバルブ (気密閉閉手段)
1 a, 1 b	処理室	6	搬送手段
2 a, 2 b	収納室	7, 7 a	N <sub>2</sub> ガス供給管
3	前処理用収納室	8, 8 a	N <sub>2</sub> ガス供給源
4	搬送室	10	真空ポンプ
		40	処理用加熱管

## 【特許請求の範囲】

【請求項1】 被処理体を処理する処理室と、被処理体を収納する収納室と、前処理される被処理体を収納する前処理用収納室と、気密開閉手段を介して上記処理室、収納室及び前処理用収納室との間に配設される搬送室と、上記搬送室内に配設されて、上記処理室、収納室及び前処理用収納室内の被処理体の搬出・搬入を司る搬送手段とを具備し、

上記処理室、収納室、前処理用収納室及び搬送室内を所定のガス雰囲気とすることを特徴とする搬送処理装置。

【請求項2】 搬送手段を、搬送室内に露出する搬送駆動部と、上記搬送室と区画される駆動室内に配設される昇降駆動部とで構成し、

上記搬送駆動部と昇降駆動部との間に、搬送駆動部を搬送室内に最露出した際に搬送室と駆動室とを遮断する気密手段を配設し、

上記駆動室内を上記搬送室と別に所定ガス雰囲気とすることを特徴とする請求項1記載の搬送処理装置。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】 この発明は、例えば半導体ウエハ等の被処理体を所定の処理部に搬送する搬送処理装置に関するものである。

【0002】

【従来の技術】 一般に、半導体ウエハ（以下にウエハという）の製造プロセスにおいて、ウエハの表面に薄膜を形成する薄膜形成装置、酸化膜を形成する酸化装置や不純物を導入する不純物導入装置等が使用されている。そして、これら薄膜、酸化膜等を形成する装置として、ガス反応と加熱により処理する表面処理装置が使用されて

【0003】 従来、この種の表面処理装置を用いてウエハを処理するには、所定枚数のウエハを収容したカセットから搬送アーム等の搬送手段によってウエハを取出し、表面処理装置の処理室内に搬送して、熱処理を行った後、処理室からウエハを取出している。また、処理能率の向上を図るために、複数の表面処理装置を配設すると共に、各表面処理装置の処理室に対して搬送手段を配設している。

【0004】

【発明が解決しようとする課題】 しかしながら、従来のこの種の装置においては、表面処理装置の処理室に被処理体を搬送する場合、大気中から直接処理室内に搬送しているため、被処理体が大気中に晒され、被処理体がごみの付着や自然酸化膜の形成等によって大気汚染され、製品歩留りの低下を招く虞れがあった。

【0005】 また、処理室を複数設けた場合には、複数の処理室に対して搬送手段も複数必要とするか、搬送手段の移動範囲を広くする必要があるため、設置スペースを大きくすると共に、装置を大型化しなければならない

という問題もあった。

【0006】 この発明は上記事情に鑑みなされたもので、被処理体の処理前の大気汚染を防止して、製品歩留りの向上を図り、かつ、設置スペースの有効利用及び装置の小型化を図れるようにした搬送処理装置を提供することを目的とするものである。

【0007】

【課題を解決するための手段】 上記目的を達成するために、この発明の搬送処理装置は、被処理体を処理する処理室と、被処理体を収納する収納室と、前処理される被処理体を収納する前処理用収納室と、気密開閉手段を介して上記処理室、収納室及び前処理用収納室との間に配設される搬送室と、上記搬送室内に配設されて、上記処理室、収納室及び前処理用収納室内の被処理体の搬出・搬入を司る搬送手段とを具備し、上記処理室、収納室、前処理用収納室及び搬送室内を所定のガス雰囲気とすることを特徴とするものである。

【0008】 この発明において、上記搬送手段は搬送室内に配設されて、処理室、収納室及び前処理用収納室内の被処理体の搬出・搬入を司るものであれば任意の機構のものでよいが、好ましくは搬送手段を、搬送室内に露出する搬送駆動部と、上記搬送室と区画される駆動室内に配設される昇降駆動部とで構成し、上記搬送駆動部と昇降駆動部との間に、搬送駆動部を搬送室内に最露出した際に搬送室と駆動室とを遮断する気密手段を配設し、かつ上記駆動室内を上記搬送室と別に所定ガス雰囲気にする方がよい。

【0009】

【作用】 上記のように構成されるこの発明の搬送処理装置によれば、気密開閉手段を介して接続される収納室、前処理用収納室及び搬送室内を所定のガス雰囲気とすることにより、本処理及び処理中の被処理体を大気と遮断して大気汚染から保護することができる。また、搬送室を、処理室、収納室及び前処理用収納室の間に配設することにより、1種類の搬送手段によって被処理体の搬送を行うことができる。また、搬送室から区画される駆動室内を搬送室と別に所定ガス雰囲気とすることにより、駆動室内の昇降駆動部を真空雰囲気に晒ずに所定のガス雰囲気におくことができる。

【0010】

【実施例】 以下にこの発明の実施例を図面に基いて詳細に説明する。ここでは、この発明の搬送処理装置をウエハの表面処理装置に適用した場合について説明する。

【0011】 図1はこの発明の搬送処理装置の概略構成図、図2はその概略斜視図が示されている。

【0012】 この発明の搬送処理装置は、被処理体であるウエハWを処理する2つの処理室1a、1bと、ウエハWを収納する2つの収納室2a、2bと、前処理されるウエハWを収納する前処理用収納室3と、気密開閉手段であるゲートバルブ5を介して処理室1a、1b、収

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納室2a、2b及び前処理用収納室3との間に配設される搬送室4とを具備してなる。そして、搬送室4内には、処理室1a、1b、収納室2a、2b及び前処理用収納室3内のウエハWの搬出・搬入を司る搬送手段6が配設されている。また、処理室1a、1b、収納室2a、2b、前処理用収納室3及び搬送室4には、それぞれ例えば窒素(N<sub>2</sub>)ガス、アルゴン(Ar)等の不活性ガスあるいはこれらとの混合ガスの供給管7(以下にN<sub>2</sub>ガス供給管という)を介してN<sub>2</sub>ガス供給源8が接

【0013】ウエハWを収容する収納室2a、2bは、外部の大気雰囲気との間を開閉するゲートバルブ5aと、図示しない回転機構によって回転するターンテーブル13とを具備してなり、ターンテーブル13上には、例えば5個のウエハカセット14が周方向に等間隔に載置されている。このように構成される収納室2a、2bは、真空ポンプ10によって所定の真空度まで減圧された後、ガス供給管7からN<sub>2</sub>ガスが供給された状態で図示しない通気管よりN<sub>2</sub>ガスを排気して常時新たなN<sub>2</sub>ガスが流通されることによって、収納室2a、2b内に発生したパーティクルを排出してウエハWへのパーティクルの付着を抑制している。

【0014】搬送室4内に配設される搬送手段6は、図3に示すように、搬送室4内に露出する搬送駆動部15と、搬送室4と区画される駆動室16内に配設される昇降駆動部17とで構成されている。この場合、搬送駆動部15は、駆動室16内に配設される昇降モータ18によって駆動室16の上部を昇降する駆動基部19と、駆動基部19内に磁気シール等の気密手段20を介して配設される駆動モータ21によって水平方向に回転される第1のアーム22aと、第1のアーム22aの先端部に回転可能に接続される第2のアーム22bと、第2のアーム22bの先端部に回転可能に接続されるウエハ保持アーム22cとからなる多関節搬送アームロボットにて形成されている。このように構成される搬送手段6は、昇降モータ18及び駆動モータ21の駆動によって垂直方向(V)と水平方向の回転( $\theta$ )及び伸縮方向(H)に移動自在に形成されている。なお、図面ではウエハ保持アーム22cが1つの場合について説明したが、ウエハ保持アーム22cを垂直方向に適宜間隔をおいて複数(例えば5個)設けることも可能である。また、駆動基部19の下端部に可動ブロック23が固着されており、この可動ブロック23は、駆動室16内に垂直方向に平行に配設される2本のガイドレール24に沿って摺動可能に配設されると共に、ガイドレール24と平行に配設されるボールねじ軸25に螺合されている。そして、ボールねじ軸25はギア等の伝達機構26を介して昇降モータ18に連結されている。したがって、昇降モータ1

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8の駆動により伝達機構26を介してボールねじ軸25が回転し、ボールねじ軸25の回転に伴って可動ブロック23を介して駆動基部19及び搬送駆動部15が昇降するようになってる。

【0015】また、駆動基部19の可動ブロック23の上部に緩衝防止用のステンレス製の蛇腹管27を介して取付板28が配設されており、この取付板28の上面には、駆動室16の上部開口部の周辺下面に当接する気密手段であるOリング29が装着されている。したがって、昇降モータ18の駆動によって駆動基部19が最上部まで移動した際にOリング29が駆動室16の上部下面に当接することにより駆動室16内と搬送室4とが気密状態に区画される。

【0016】更に、上記のように構成される駆動室16には、搬送室4に接続されるガス供給管7と別のN<sub>2</sub>ガス供給管7aを介してN<sub>2</sub>供給源8aが接続されると共に、通気管30が接続されて、搬送室4とは別系統のガス供給系によって駆動室16内がN<sub>2</sub>ガス雰囲気におかれるようになっている。

【0017】上記のように、搬送手段6を搬送駆動部15と昇降駆動部17とに分離形成することにより、昇降駆動部17の駆動系すなわち昇降モータ18や図示しないエンコーダ等を真空用にする必要がなく、通常の大気用のものを使用することができる。また、搬送駆動部15を搬送室4内に最露出した状態で搬送室4内を真空状態にした後、N<sub>2</sub>ガスを供給することができるので、少ないN<sub>2</sub>ガスの使用によって搬送室4内の酸素(O<sub>2</sub>)濃度を低下することができる。

【0018】上記処理室1a、1bは、その内部にウエハWを昇降するウエハポート31を配設してなり、処理室1a、1bの上方にはウエハポート31にて保持された複数枚のウエハWを同時に熱処理する表面処理装置40が搭載されている。この場合、ウエハポート31は、図4に示すように、基台32に対して図示しない駆動機構によって昇降可能な昇降台33と、この昇降台33上に図示しない回転機構によって回転自在に支承される回転板34と、この回転板34上に回転可能に載置される保温筒35と、保温筒35の上方に立設される4本の支柱36とで構成されており、各支柱36の対向側面に設けられた等間隔の保持溝(図示せず)によって複数枚のウエハWを間隔をおいて保持し得るようになっている。

【0019】表面処理装置40は、図5に示すように、同心状に適宜間隔をおいて配設される石英製の内筒41と石英製の外筒42とからなる反応容器43にて主要部が構成されている。また、外筒42及び内筒41はそれぞれその下端にて例えばステンレス等にて形成される筒状のマニホールド45にて保持されており、このマニホールド45は図示しないベースプレートにて固定されている。マニホールド45の下端部の開口部は上記ウエハポート31の昇降台33にて開閉されるようになってい

る。また、マニホールド45の側面から反応容器43内にインジェクタ46が気密に挿入されており、このマニホールド45の内端側はL字状に屈曲されて、内筒41の内側に上方に向けて垂直に伸びている。インジェクタ46の外端側に接続されるガス供給源（図示せず）からCVD用のガスであるジシラン（ $\text{C}_2\text{H}_2\text{C}_2\text{H}_2$ ）ガスやアンモニアガス（ $\text{NH}_3$ ）がガス流出口46aから反応容器43内に供給されるようになっている。反応容器43内で処理に供された処理ガスはマニホールド45の側面に設けられた排気路47から外部に排出されるようになっている。

【0020】一方、前処理用収納室3にはゲートバルブ5を介して例えば洗浄装置等の前処理装置50が連結されている。この前処理用収納室3内には、前処理の必要なウエハWを仮収納するウエハ仮保持部37が配設されている。このウエハ仮保持部37は、図6に示すように、基台32aに対して図示しない駆動機構によって昇降自在な昇降台33aに矩形枠状のバッファカセット38を載置してなり、バッファカセット38の対向する内壁に等間隔をおいて設けられた保持溝39にウエハWを仮保持し得るようになっている。したがって、搬送手段6にて搬送されるウエハWをバッファカセット38に仮保持した状態で、前処理装置50側の搬送アーム51にてウエハWを保持して前処理装置に搬送することができ、前処理用収納室3内においてパッチ処理と枚葉処理とを交換することができる。

【0021】次に、この発明の搬送処理装置の作動態様について図1を参照して説明する。

#### 【0022】①実施例1

まず、使用に際して、真空ポンプ10を作動して収納室2a、2b、搬送室4、処理室1a、1b及び前処理用収納室3内を真空状態にした後、 $\text{N}_2$ ガス供給源8から各室内に $\text{N}_2$ ガスを供給して各室内を $\text{N}_2$ ガス雰囲気にする。この際、搬送室4内に配設される搬送手段6の搬送駆動部15を最上位置に移動させて、リング29により駆動室16と搬送室4とを遮断し、駆動室16内に別系統の $\text{N}_2$ ガス供給源8aから $\text{N}_2$ ガスを供給することによって駆動室16内も $\text{N}_2$ ガス雰囲気にし、各室の $\text{O}_2$ 濃度を低下させる。

【0023】次に、第1の収納室2aと搬送室4との間のゲートバルブ5が開放し、搬送手段6のウエハ保持アーム22cが収納室2a内に挿入して収納室2a内に収納されたウエハカセット14内からウエハWを受取った後、搬送室4と第1の処理室1aとの間のゲートバルブ5が開放して、第1の処理室1a内にウエハ保持アーム22cが挿入して第1の処理室1a内のウエハポート31にウエハを受け渡す。

【0024】このようにして所定枚数のウエハWをウエハポート31に受け渡した後、搬送室4と第1の処理室1aとの間のゲートバルブ5が閉じて、ウエハポート3

1が上昇し、第1の表面処理装置40の反応容器43内に挿入して、ウエハポート31の昇降台33によって反応容器43と第1の処理室1aとを遮断した後、所定の処理を行う。第1の表面処理装置40においてウエハWの表面処理を行っている間、搬送手段6によって第2の収納室2b内のウエハWを第2の処理室1b内のウエハポート31に受け渡して、上記と同様に第2の表面処理装置40にてウエハWの処理を行うことも可能である。

【0025】ウエハWの表面処理が終了した後、反応容器43からウエハポート31を下降して第1の処理室1a内に移動した後、前述と逆の動作によって処理済みのウエハWを第1の収納室2a内のウエハカセット14に受け渡してウエハWの処理は完了する。また、同様に第2の処理室1bの処理済みのウエハWは第2の収納室2bのウエハカセット14に受け渡される。

#### 【0026】②実施例2

上記実施例1と同様に各室を真空引きした後、 $\text{N}_2$ ガスを供給して各室内を $\text{N}_2$ ガス雰囲気とする。そして、搬送手段6によって収納室2a、2bから受け取られたウエハWを前処理用収納室3に搬送し、前処理用収納室3のバッファカセット38に仮保持されたウエハWを前処理装置50に搬送してウエハWに付着したパーティクルや自然酸化膜等の除去を行う。

【0027】前処理装置50によって前処理が行われたウエハWを上記実施例1と同様に処理室1a、1bのウエハポート31に受け渡して、表面処理装置40によって表面処理した後、収納室2a、2bのウエハカセット14に受け渡してウエハWの処理は完了する。

#### 【0028】③実施例3

上記実施例1、2では収納室2a又は2bから取出されたウエハWを1つの処理室1a又は1bに搬送し、表面処理装置40によって処理する場合について説明したが、異なる種類の表面処理を連続して行うことも可能である。

【0029】すなわち、例えば第1の表面処理装置40にて表面処理され、第1の処理室1aにおかれたウエハWを搬送手段6にて受け取った後、第2の処理室1b内に搬送し、第2の表面処理装置40にて表面処理を行うことができる。この場合、第1の表面処理装置40と第2の表面処理装置40とを逆にしてもよく、また、ウエハWの前処理が必要な場合には、前処理用収納室3に搬送して、前処理を行った後に第1又は第2の処理室1a、1b内にウエハWを搬送すればよい。

【0030】なお、上記実施例では搬送室4を中心として、その周囲に2つの処理室1a、1b、2つの収納室2a、2b及び1つの前処理用収納室3を配設した場合について説明したが、必ずしもこのような配置構造とする必要はなく、少なくとも搬送室4の周囲に1つの処理室1a又は1b、収納室2a又は2bを配設した構造であってもよい。

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【0031】上記実施例では被処理体が半導体ウエハの場合について説明したが、被処理体は必ずしも半導体ウエハに限られものではなく、例えばLCD基板あるいはプリント基板、フォトマスク、セラミック基板、コンパクトディスクなどについても同様に搬送処理することができる。

【0032】

【発明の効果】以上に説明したように、この発明の搬送処理装置によれば、上記のように構成されているので、以下のような効果が得られる。

【0033】1) 請求項1記載の搬送処理装置によれば、気密開閉手段を介して接続される収納室、前処理用収納室及び搬送室内を所定のガス雰囲気とするので、未処理及び処理中の被処理体を大気と遮断して大気汚染から保護することができると共に、製品歩留りの向上が図れる。また、搬送室を、処理室、収納室及び前処理用収納室の間に配設するので、1種類の搬送手段によって被処理体の搬送を行うことができ、設置スペースの有効利用及び装置の小型化が図れる。

【0034】2) 請求項2記載の搬送処理装置によれば、搬送室から区画される駆動室内を搬送室と別に所定ガス雰囲気にするので、駆動室内の昇降駆動部を真空雰囲気に晒すに所定のガス雰囲気におくことができ、構成部材の低コスト化及び消費ガス量の低減化が図れる。

【図面の簡単な説明】

【図1】この発明の搬送処理装置の概略構成図である。

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【図2】この発明の搬送処理装置の概略斜視図である。

【図3】この発明における搬送手段を示す断面図である。

【図4】この発明におけるウエハポートと搬送手段を示す概略斜視図である。

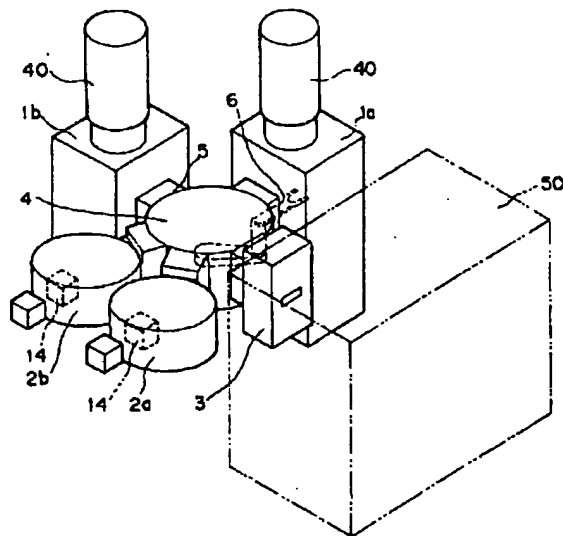
【図5】この発明における熱処理炉を示す断面図である。

【図6】この発明における前処理収納室の載置台を示す概略斜視図である。

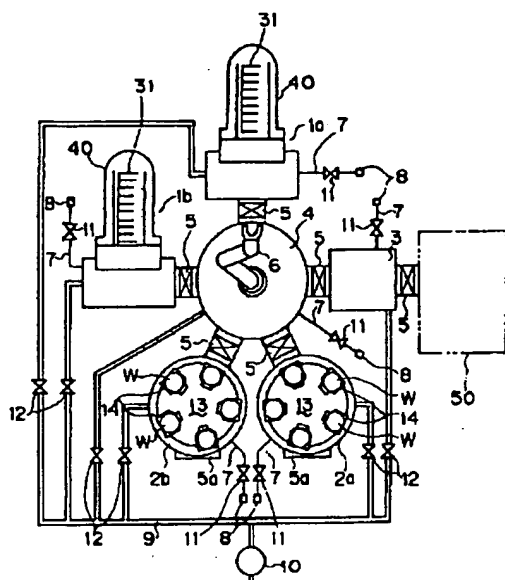
10 【符号の説明】

- W 半導体ウエハ (被処理体)
- 1a, 1b 処理室
- 2a, 2b 収納室
- 3 前処理用収納室
- 4 搬送室
- 5 ゲートバルブ (気密開閉手段)
- 6 搬送手段
- 7, 7a N<sub>2</sub> ガス供給管
- 8, 8a N<sub>2</sub> ガス供給源
- 10 真空ポンプ
- 15 搬送駆動部
- 16 駆動室
- 17 昇降駆動部
- 29 Oリング (気密手段)
- 40 表面処理装置

【図2】

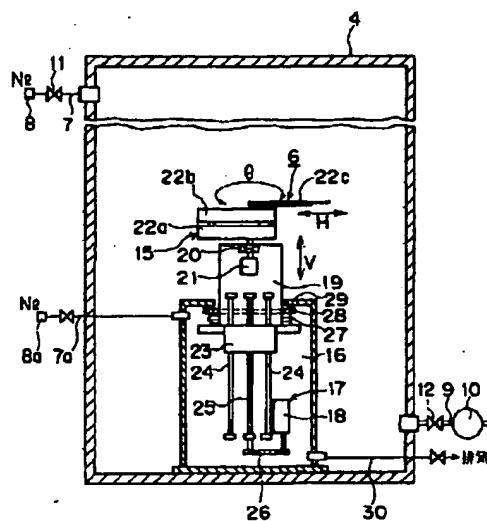


【図1】



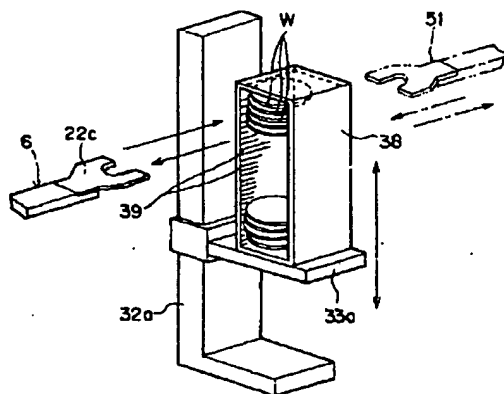
- W 半導体ウェハ (被処理体)    5 ゲートバルブ (気密開閉手段)  
 1 a, 1 b 処理室    6 搬送手段  
 2 a, 2 b 収納室    7, 7 a N<sub>2</sub> ガス供給管  
 3 前処理用収納室    8, 8 a N<sub>2</sub> ガス供給源  
 4 製造室    10 真空ポンプ  
                   40 表面処理装置

【図3】

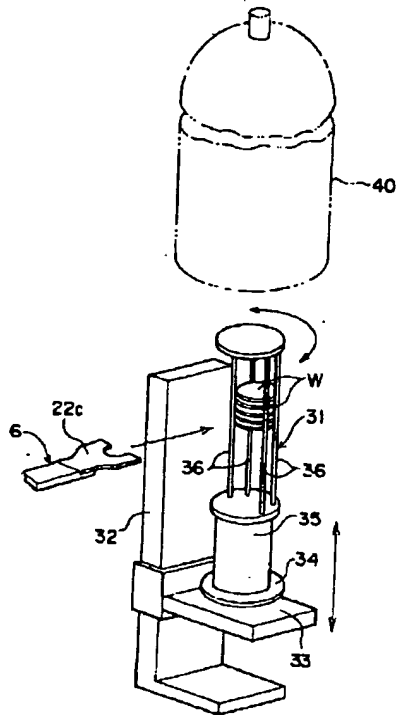


- 15 搬送駆動部  
 16 密封部  
 17 昇降駆動部  
 29 Oリング (気密手段)

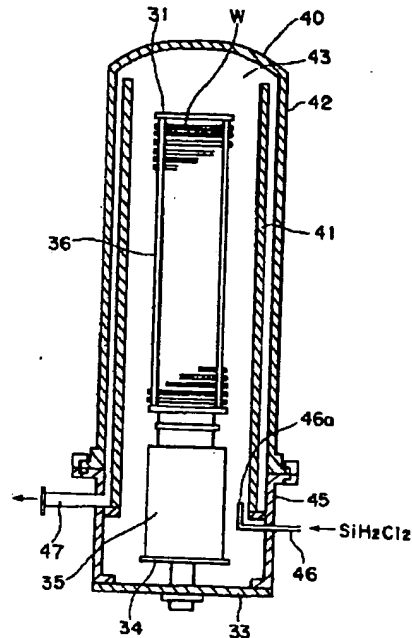
【図6】



【図4】



【図5】



## 【手続補正書】

【提出日】平成4年12月16日

## 【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】0019

【補正方法】変更

## 【補正内容】

【0019】 表面処理装置40は、図5に示すように、同心状に適宜間隔をおいて配設される石英製の内筒41と石英製の外筒42とからなる反応容器43にて主要部が構成されている。また、外筒42及び内筒41はそれぞれその下端にて例えばステンレス等にて形成される筒状のマニホールド45にて保持されており、このマニホールド45は図示しないベースプレートにて固定さ

れている。マニホールド45の下端部の開口部は上記ウエハポート31の昇降台33にて開閉されるようになっている。また、マニホールド45の側面から反応容器43内にインジェクタ46が気密に挿入されており、このマニホールド45の内端側はL字状に屈曲されて、内筒41の内側に上方に向けて垂直に伸びている。インジェクタ46の外端側に接続されるガス供給源（図示せず）からCVD用のガスであるジシラン（ $\text{SiH}_2\text{Cl}_2$ ）ガスやアンモニアガス（ $\text{NH}_3$ ）がガス流出口46aから反応容器43内に供給されるようになっている。反応容器43内で処理に供された処理ガスはマニホールド45の側面に設けられた排気路47から外部に排出されるようになっている。

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